

144
CR 134305

Contract NAS 9-12200
Job Order No. 73-213
LEC No. TM642-216

TECHNICAL MEMORANDUM

Action Document No. 63-0257-3213-07

PROGRAM CALIB

BY

M. A. MENDLOWITZ

Approved: O. N. Brandt

O. N. Brandt
Supervisor, Sensor
Performance Evaluation
Section

Distribution:

JSC/T. L. Barnett
A. L. Grandfield
A. E. Potter
LEC/J. E. Davis
C. L. Hughes
R. E. Tokerud
Department File

MARCH 1973

LOCKHEED ELECTRONICS COMPANY, INC., HOUSTON AEROSPACE SYSTEMS DIVISION



This document was prepared by Lockheed Electronics Company, Inc., Houston Aerospace Systems Division under Contract NAS9-12200, Job Order 73-213 and was issued at the Johnson Space Center, Houston, Texas, in accordance with Action Document Number 63-0257-3213-07. Acknowledgement is made to M. A. Mendlowitz of Lockheed Electronics Company, Inc. for developing this program. Further acknowledgement is made to Dr. Barnett who defined the equations and techniques to be used.

I. INTRODUCTION

Program CALIB was written to compute noise levels and average signal levels of the aperture radiance for the helicopter version of the S-191 filter wheel spectrometer. The tests to be performed on this instrument will include the scanning of various calibrated blackbodies at different temperatures with both of the spectrometers two filter wheels. Data gathered from these tests will be analyzed by this program. Because the final format specifications for the S191 data tapes were not available at the time of the writing of this program (November and December of 1972), a simulated format was used to check it out. This format may be modified when final specifications for the output tapes are made.

II. PROGRAM FUNCTIONS

Program CALIB performs the following operations:

1. Reads information pertaining to the required calculations off computer cards.
2. Reads calibration data off S191 data tapes.
3. Computes average signal levels and noise levels (average deviation) at prescribed times on a per-channel, per-target basis.

The formulas used are:

$$S_i = \frac{\sum_{j=1}^N s_{ij}}{N} ; \quad D_i = \frac{\sum_{j=1}^N |S_i - s_{ij}|}{N}$$

Where the symbols are:

s_{ij} - Signal from the j^{th} data record of the i^{th} channel

N - Number of data records from the i^{th} record being used to average

S_i - Average signal to the i^{th} channel

D_i - Average deviation of the i^{th} channel

III. INPUT DESCRIPTION

Input into program CALIB is specified in three ways:

1. Information hard coded into the program
2. Information read off computer cards
3. Information read off tapes (simulated in the present version of this program).

HARD CODED DATA (1)

<u>VARIABLE NAME</u>	<u>FORMAT</u>	<u>DESCRIPTION</u>
NCASE	INTEGER	Number of different targets for which calibration calculations are to be performed
NLEV	INTEGER	Location of the flag which specifies which of the two filter wheels in the spectrometer are being used
NWORD	INTEGER	Number of words per record on input data tape
NITER	INTEGER	Number of successive data records over which averages are made to compute signal and noise levels

COMPUTER CARD DATA (2)

Program CALIB reads only one type of data card. The number of data cards of this type read is determined by the variable NCASE which is hard coded into the program. (See previous section)

VARIABLE NAME	FORMAT	DESCRIPTION	COLUMNS
START	FLOATING POINT	Starting time for computations to begin	1-10
TINT	"	Temperature of spectrometer internal black body reference	11-20
TEMP	"	Temperature of target	21-30
TITLE	ALPHA NUMERIC	Description or general comments about target	31-70

TAPE INFORMATION (3)

<u>VARIABLE NAME</u>	<u>FORMAT</u>	<u>DESCRIPTION</u>
STUFF	FLOATING POINT	Aperture radiances of S191 for a specific target in question
TIME	"	Time at which computations are to begin

COMPILED PROGRAM LISTING

ORTRAN V EXEC TI LEVEL 25A - (EXECB LEVEL E12010010A)
 ION WAS DONE ON 20 FEB 73 AT 11:52:06

AM
 ED: CODE(1) 000513; DATA(0, 000112; BLANK COMMON(2) 000000

CK5:

045212

REFERENCES (BLOCK, NAME)

END
 JUS
 JIS
 J23
 JUS
 JCS
 JOPS

SIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0021	1000F	0000	000052	1003F	0001	000037	1005L	0001	000044	1			
0067	1000L	0001	000115	1005L	0001	000207	1009L	0001	000020	1			
0104	1516	0000	000030	1525F	0000	000057	1560F	0000	000062	1			
0170	1776	0001	000215	2106	0001	000226	2146	0001	000227	2			
0255	2326	0001	000272	2416	0001	000303	2456	0001	000304	2			
0346	2706	0001	000363	2776	0001	000376	3116	0001	000411	3			
0431	3356	0001	000452	3506	0001	000463	3546	0001	000464	3			
0726	AVE	0003	R	000000	DATA	0003	R	043310	DEV	0000	I	000007	I
0574	ICOUNT	0000	I	000001	ISPECT	0000	I	000010	J	0000	I	000020	K
0016	LEV	0000	I	000014	M	0000	I	000017	N	0000	I	000000	N
0002	NLEV	0000	I	000005	NSTART	0000	I	000006	NTIME	0000	I	000003	N
0416	STUFF	0003	R	043202	TEMP	0000	R	000015	TEST	0000	R	000013	T
0576	TITLE												

COMMON/CAL/ DATA(2,90,100) , START(50) , TEMP(50) , TINT(20) ,
 I DEV(2,90) , ICOUNT(2) , TITLE(8,50) , STUFF(200) , AVE(2,90)

NCASE = 15

ISPECT = 7

NLEV = 7

NWORD = 112

NITER = 85

NSTART = 15

NTIME = 1

1000 FORMAT(IH1)

DO 1004 I=1,NCASE

READ(5,1003) START(I) , TINT(I) , TEMP(I) , (TITLE(J,I) ,J=1,7)

1003 FORMAT(3F10.2 , 8A6)

1004 CONTINUE

1005 ICASE = ICASE + 1

```

      ICOUNT(1) = 0
      ICOUNT(2) = 0
1010 CONTINUE
      CALL MREAD( 3 , 1 , STUFF(1) , NWORD , J , L )
1020 IF(10-1) 1025,1020,1025
1025 CONTINUE
      TIME = STUFF(1)
      IF( TIME .GE. START(ICASE) ) GO TO 1050
      GO TO 1010
1050 CONTINUE
      DO 1090 M = 1, NITER
      CALL MREAD(3,1,STUFF(1),NWORD,J,L)
1055 IF(J-1) 1060,1055,1060
1060 CONTINUE
      TEST = STUFF(20) + STUFF(30) + STUFF(40) + STUFF(50)
      IF ( TEST .LT. 10. ) GO TO 1090
      WRITE(6,9999) M , (STUFF(I),I=1,120)
9999 FORMAT(1H , 13.7 , 20(10F12.4,7) )
      LEV = STUFF(NLEV) + .1
      ICOUNT(LEV+1) = ICOUNT(LEV+1) + 1
      N = ICOUNT(LEV+1)
      DO 1080 I=1,90
      J = I - LEV*( 2.1 - 91 )
      DATA(LEV+1 , J , N) = STUFF(I+ISPECT)
1085 CONTINUE
1090 CONTINUE
      DO 1200 I=1,2
      L = ICOUNT(I)
      DO 1200 J=1,90
      DO 1200 K=1,L
      AVE(I,J) = AVE(I,J) + DATA(I,J,K)
1200 CONTINUE
      DO 1400 I=1,2
      DO 1400 J=1,90
      AVE(I,J) = AVE(I,J) / FLOAT( ICOUNT(I) )
1400 CONTINUE
      DO 1500 I=1,2
      L = ICOUNT(I)
      DO 1500 J=1,90
      DO 1500 K=1,L
      DEV(I,J) = ABS( DATA(I,J,K) - AVE(I,J) ) + DEV(I,J)
1500 CONTINUE
1510 WRITE(6,1000)
      WRITE(6,1525)
1525 FORMAT(1H , // , 2X , 'SCAN' , 4X , 'POSITION' , 2X ,
1 'TEMPERATURE' , 2X , 'DEVIATION' , 2X , 'AVERAGE' , 10X ,
2 'COMMENTS' , 41X , 'COUNT' , 3X , 'CASE' , // )
      DO 1550 I=1,2
      DO 1550 J=1,90
      DEV(I,J) = DEV(I,J) / FLOAT( ICOUNT(I) )
1550 CONTINUE
      DO 1570 J=1,90
      PUNCH 1560 ICASE,J,TINT(ICASE) , TEMP(ICASE) , AVE(1,J) , AVE(2,J)
1 , ( TITLE(I,J),I=1,6 )
1560 FORMAT(215, 4F8.1 ,6A6)
1570 CONTINUE
      DO 1590 I=1,2
      DO 1590 J=1,90

```

```

WRITE(6,1580) I,J,TEMP(ICASE),DEV(I,J),AVE(I,J) ,
1 (TITLE(M,ICASE),M=1,8) , ICOUNT(I) , ICASE
1580 FORMAT(1H , 2I10 , 3F10.2 , 10X , 8A6 , 3X , 13 ,5X , 13 )
1590 CONTINUE
DO 1600 I=1,2
L = ICOUNT(I)
DO 1600 J=1,90
DO 1600 K=1,L
DATA(I,J,K) = 0.0
AVE(I,J) = 0.0
DEV(I,J) = 0.0
1600 CONTINUE
WRITE(6,1590)
GO TO 1605
END

```

IMPLICATION: NO DIAGNOSTICS.